



12th Science : Physics  
Dual Nature of Radiation and Matter,

DATE:

TIME: 1 hr

MARKS: 25

SEAT NO:

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**Note:-**

1. All Questions are compulsory.
2. Numbers on the right indicate full marks.

**Section A**

**Q.1 Select and Write the correct answer.**

**(4)**

1. The maximum wavelength of radiation that can produce photoelectric effect in a certain metal is 200 nm. The maximum kinetic energy acquired by electron due to radiation of wavelength 100nm will be  
A) 12.4eV      B) 6.2 eV  
C) 100 eV      D) 200 eV
2. If the kinetic energy of the particle is increased to 16 times its previous value, the percentage change in the De-Broglie wavelength of the particle is  
A) 25%      B) 75%  
C) 60%      D) 50%
3. For a certain metal  $n = 2n_0$  and the electrons come out with a maximum velocity of  $4 \times 10^6$  m/s. If the value of  $n = 5n_0$ , then maximum velocity of the photoelectrons will be  
A)  $8 \times 10^5$  m/s      B)  $2 \times 10^6$  m/s  
C)  $8 \times 10^6$  m/s      D)  $2 \times 10^7$  m/s
4. The work function of a metal is 1 eV. Light of wavelength  $3000 \text{ \AA}$  is incident on this metal surface. The velocity of emitted photoelectrons will be  
A)  $10 \text{ ms}^{-1}$       B)  $10^3 \text{ ms}^{-1}$   
C)  $10^4 \text{ ms}^{-1}$       D)  $10^6 \text{ ms}^{-1}$

**Q.2 Answer the following.**

**(3)**

1. What is effect of intensity on stopping potential in photoelectric emission?
2. All the photoelectrons are not emitted with the same energy. The energies of photoelectrons are distributed over a certain range. Why?
3. Define : Photoelectric work function

**Section B**  
**Attempt any Four**

Q.3 Using the values of work function given in Table 14.1, tell which metal will require the highest (2) frequency of incident radiation to generate photocurrent.

<b>Metal</b>	<b>Work function (in eV)</b>
Potassium	2.3
Sodium	2.9
Zinc	3.6
Silver	4.3
Aluminum	4.3
Tungsten	4.5
Copper	4.7
Nickel	5.0
Gold	5.1

Q.4 What do you understand by the term wave-particle duality? Where does it apply? (2)

Q.5 An electron,  $\alpha$ -particle and a proton have the same kinetic energy. Which of these particles has (2) the shortest de Broglie wavelength?

Q.6 What are characteristic properties of particles of matter? (2)

Q.7 Calculate frequency of photon having energy 66 eV. (2)

Q.8 What is the speed of a proton having de Broglie wavelength of  $0.08 \text{ \AA}$ ? (2)

**Section C**  
**Attempt any Two**

Q.9 A particular metal used as a cathode in an experiment on photoelectric effect does not show (3) photoelectric effect when it is illuminated with green light. Which of the colours in the visible spectrum are likely to generate photocurrent?

Q.10 Why don't we consider wavelengths associated with macroscopic particle? (3)

Q.11 The energy of photon is 2 eV. Find the frequency and wavelength. (3)

**Section D**  
**Attempt any One**

Q.12 How will you justify that the rest mass of photon is zero. (4)

If a light of wavelength  $4000 \text{ \AA}$  is incident on a metal surface of work function 5 eV will the photoelectrons be ejected or not?

Q.13 Write Einstein's photoelectric equation and explain the terms involved in it. (4)